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(54) **Non-tempering confectionery fat.**

(57) The invention is concerned with blends of cocoa-butter replacement fats A which are high in SSU and fats B which are high in S'OS', wherein :

- fats A display a ratio

$$\frac{N30 \text{ (stab.)}}{N30 \text{ unstab.}} = 1-3$$

- fats A and B are present in amounts providing an SSU content of $\geq 50\%$ and an S'OS' content of $< 30\%$ in the blend (S = saturated fatty acid, S' = saturated C₁₆-C₁₈, U = unsaturated fatty acid; O = oleic acid).

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Confectionery fats that are used for the preparation of confectionery products often need to be tempered in order to bring the triglycerides into the desired stable crystal form. This is especially true of fats based on symmetrical mono-unsaturated triglycerides of the SUS type, such as cocoa butter and cocoa-butter substitutes containing shea, illipe or palm oil fractions. However, tempering is a difficult, sophisticated, time- and energy-consuming technique and therefore industry would prefer to avoid tempering, if possible.

For this purpose, much effort has been spent finding vegetable fat compositions that do not need to be tempered. Solutions were found in the use of lauric-type fats and in fats high in trans-fatty acids. However, the use of these fats entailed other problems as lauric fats hydrolyze easily, leading to an undesirable off-taste, while trans-fatty acids have an unknown dietary significance and can also lead to post-hardening during product storage, causing a poor mouthfeel.

Efforts over many years to derive satisfactory vegetable-based, non-tempering, non-trans, non-post-hardening, non-lauric confectionery fats for stable, bloom-resistant products have so far been unsuccessful.

In BP 841,316 and BP 841,317 the use of lard and tallow animal fat fractions is disclosed as additives to cocoa butter and palm triglycerides for incorporation in chocolate. The lard fractions disclosed are known to contain triglycerides of the SSU type but the disclosed fractions are incorporated with up to 60 wt.% of fats containing high amounts (> 75%) of SUS triglycerides for their intended use.

In EP 354,025 a fat composition is disclosed that contains at least 20 wt.% of triglycerides of the SSU type (S = saturated fatty acids; U = unsaturated fatty acids). These fats are reported to prevent bloom formation of confectionery fats, in particular in chocolate. According to the Examples, only limited amounts of SSU are added to the fat composition. Therefore, in all the cases where the SSU fat was added to a fat requiring tempering, tempering still had to be performed. Only when non-tempering fats were used that are high in trans-fatty acids could tempering be omitted.

We have now found new all-vegetable, non-tempering, non-lauric fat compositions useful for confectionery products in which properties, such as demoulding behaviour, gloss, hardness and melt-down remain surprisingly good.

Our new non-tempering, non-trans, all-vegetable confectionery fat compositions comprise at least a cocoa-butter replacement fat A that is high in SSU and a fat B that is high in S'OS', wherein fat A displays a ratio between the solid fat indices, measured at 30 °C, stabilized and unstabilized (NMR pulse) of

$$\frac{N_{30}(\text{stab.})}{N_{30}(\text{unstab.})} = 1-3$$

$$N_{30}(\text{unstab.})$$

and wherein fats A and B are present in ratios providing a fat blend with an SSU content of at least 50 wt.% and an S'OS' content of less than 30 wt.%, wherein S = saturated fatty acid having C₁₆-C₂₄; S' = saturated fatty acid having C₁₆/C₁₈, O = oleic acid and U = predominantly oleic and/or linoleic acid.

N₃₀ (stab)-values are conveniently measured after rapidly cooling the fat from 80 °C to 0 °C, keeping it at 0 °C for 1.5 hrs; 40 hrs at 25 °C; 1.5 hrs at 0 °C; 1 hr at 20 °C; 1 hr at 25 °C and 1 hr at 30 °C.

N₃₀ (unstab) were measured after the following regime: cooling from 80 °C to 0 °C; 1.5 hrs at 0 °C; 1 hr at 20 °C; 1 hr at 25 °C and 1 hr at 30 °C.

Although according to above the N₃₀ ratio applies for fat A, it is very convenient when also the blend of fats A and B meets this same requirement.

Preferred ranges for the S'OS' content are : less than 20 wt.%, in particular 5-15 wt.%; and for the SSU content : more than 60 wt.%, in particular 65-75 wt.%.

In this way, compositions are obtained wherein fats A and B are completely compatible. For this purpose, it is preferred that the ratio between the N-values at 30 °C is less than 2.

Fat A is advantageously a fat containing at least 60 wt.%, in particular at least 75 wt.% of SSU. Very convenient is a fat A wherein more than 60 wt.% of PPO (P = palmitic) is present.

Very good results were obtained by applying a fat A with a very sharp N-profile. An N-profile of N₂₀ > 80 and N₃₅ < 8.0 (NMR pulse, not stabilized) is very suitable.

Examples of very suitable fats A are : fractions from an enzymatically made product from the conversion of a fat rich in saturated fatty acids, in particular a palm top fraction high in P₃ and a compound providing oleic acid moieties (as disclosed in EP 209,327).

Fat B is a fat that has a high content of S'OS'. Preferred fats have an S'OS' content of at least 70 wt.%. The most preferred fat B is cocoa butter.

For the use of blends of fats A and B in confectionery product, fats A and B are blended in ratios of 95-65 wt.% of fat A and 5-35 wt.% of fat B. In this way, the desired fat compositions can easily be obtained.

Another part of our invention is the use of a fat A that is high in SSU and preferably contains at least 60 wt.% of SSU in chocolate compositions in order to obtain non-temper chocolate that demoulds easily and at the same time displays good gloss, hardness and melt-down properties.

Confectionery products containing the fat compositions disclosed above are also part of our invention.

EXAMPLES I and II

I: A small quantity of chocolate (100 g) was made initially using a typical coating recipe (Table I) with an fat rich in PPO (see Table II) replacing CB. The chocolate was not refined or conched and was used to establish satisfactory cooling tunnel conditions for moulding 50 g-bars of chocolate, commencing at 50 °C. This indicated that cooling tunnel temperatures should not be as low as 10 °C or as high as 19 °C for satisfactory demoulding. Avoidance of low cooling tunnel temperatures has throughput and energy benefits.

II: A further quantity of chocolate coating was made (Table III), following standard refining and conching procedures. This chocolate was diluted with standard CB plain chocolate to give coatings ranging in CB content from 4.8% to 28.7%.

Typical N_{30} (stab)/ N_{30} (unstab) measurements for such coating fat blends are shown in Table IV.

The molten chocolates were directly block-moulded in a cooling tunnel without tempering and stored at various temperatures. Chocolate hardness was typical of plain chocolate (Table V) and gloss retention was good in products containing less than 15% CB in the fat phase (Table VI).

TABLE I

Chocolate Coating Recipe (100 g)	
Cocoa powder (10/12)	14%
Skimmed milk powder	7%
Sugar	48%
Fat	31%
Lecithin	0.4%
[CB 4.8% on fat phase]	

The ingredients were thoroughly mixed at 50-60 °C without refining or conching.

TABLE IIComposition of PPO fatTG

SSS	6.7
SOS	2.0
OSS	77.1
SSLn	4.5
SOO	1.1
OSO	7.8
SOLn	0.6

FAME

C14:0	0.5
C16:0	55.6
C18:0	7.4
C18:1	33.1
C18:2	1.9

TABLE III

Chocolate coating recipe (refined and conched)Refining Recipe

10	Cocoa powder	16%
	Skimmed milk powder	8%
	Sugar	54.5%
	Fat	21%
15	Lecithin	0.2%

Conching Recipe (6 hours at 50-60°C)

20	Refined paste	88%
	Fat	12%
25	Lecithin	0.2%

Chocolate Blends

30	<u>Coating rich in OPP</u>	<u>Plain chocolate</u>	<u>Chocolate blend</u> <u>Fat phase CB</u>
35	100%	0%	4.8%
	95%	5%	9.7%
	90%	10%	14.5%
40	85%	15%	19.0%
	75%	25%	28.7%

TABLE IV

Fat blend		N30		
Fat A (PPO rich)	Fat B (SOS rich)	N30 (stab)	N30 (unstab)	N30 ratio
100	0	45.2	37.8	1.2
90	10	28.1	25.7	1.1
80	20	23.0	18.4	1.25
70	30	32.6	14.3	2.3

TABLE V

Hardness of chocolate coating rich in OPP (2 weeks' storage)				
% CB on chocolate coating fat phase	Penetration (mm ⁻¹)		Hardness (kg cm ⁻²)	
	20 ° C	25 ° C	20 ° C	25 ° C
4.8%	10.5	18.5	68	32
9.7%	11.0	22.0	64	26
14.5%	11.5	26.0	61	21
Typical plain chocolate	13	20	52	29

TABLE VI

Gloss Retention/Bloom in Chocolate coatings

% Cocoa butter on fat phase	Surface conditions 2 months at 20°C	Surface condition 1 month x 12 hr cycles 15°C/25°C
4.8%	Good	Fairly good gloss, bloom-free
9.7%	Good	Fairly good gloss, bloom-free
14.5%	Good	Dull, patchy, growth of large crystals
19.0%	Fairly good, bloom-free	Dull, patchy, growth of large crystals
28.7%	Fairly good, bloom-free	Completely dull

55 EXAMPLE III

In a further experiment two separate chocolate coatings were made (Table VII), following standard refining and conching procedures using:

(i) a fat A rich in OPP and

(ii) a fat B rich in POP

These coatings were blended to give coatings ranging in SOS content from 0% to 20% (Table VIII).

The molten chocolates were directly block-moulded in a cooling tunnel without tempering and stored at 20 °C. Gloss retention was satisfactory in coatings containing up to 20% SOS triglycerides on the fat phase (Table VIII).

TABLE VII

Refining Recipe

Cocoa powder	16%
Skimmed milk powder	8%
Sugar	54.5%
Fat A or Fat B	21%
Lecithin	0.2%

Conching recipe (5 hours at 50-60°C)

Refined paste	8.8%
Fat A or Fat B	12%
Lecithin	0.2%

Chocolate blends

<u>Coating rich in OPP</u>	<u>Coating rich in POP</u>	<u>Coating blend fat phase</u>	
		<u>S'S'U</u>	<u>S'OS'</u>
100	0	79	6
90	10	72	13
80	20	65	20
70	30	57	27

TABLE VIII

Gloss retention in chocolate coatings at 20 ° C		
Coating blend fat phase (%)	Chocolate surface	
	1 month	3 months
79 S'S'O/6 S'OS'	good	fair
72 S'S'O/13 S'OS'	good	good
65 S'S'O/20 S'OS'	good	fair
57 S'S'O/27 S'OS'	dull	-
S' = saturated fatty acids having C ₁₆ and C ₁₈ in a ratio of about 8.		

Claims

1. Non-tempering, non-trans, all-vegetable confectionery fat composition comprising at least a cocoa butter replacement fat A which is high in SSU and a fat B which is high in S,OS', wherein fat A displays the following ratio of solid fat indices, stabilized and unstabilized (NMR pulse), at 30 ° C :

$$\frac{N_{30} \text{ (stab.)}}{N_{30} \text{ (unstab.)}} = 1-3$$

and wherein fats A and B are present in ratios providing a fat blend with an SSU content of at least 50 wt.% and an S'OS' content of less than 30 wt.%, wherein S = saturated fatty acid having C₁₆-C₂₄; S' = saturated fatty acid having C₁₆-C₁₈, O = oleic acid, U = predominantly oleic and/or linoleic acid.

2. Fat composition according to Claim 1, wherein the S'OS' content is less than 20 wt.%, in particular 5-15 wt.%, while the SSU content is more than 60 wt.%, in particular 65-75 wt.%.
3. Fat composition according to Claims 1 and 2, wherein fat A is a hard fat containing at least 60 wt.%, preferably at least 75 wt.%, of SSU.
4. Fat composition according to Claim 3, wherein fat A is a fat wherein more than 60 wt.% of PPO (P = palmitic) is present.
5. Fat composition according to Claims 1-4, wherein fat A displays an N-profile (NMR pulse, not stabilized) of N₂₀ > 80 and N₃₅ < 8.0.
6. Fat composition according to Claims 1-5, wherein fat A is a fraction from an enzymatically made product from the conversion of a fat rich in saturated fatty acid, in particular palm oil top fraction which is high in P₃ and a compound providing oleic acid moieties.
7. Fat composition according to Claims 1-2, wherein fat B contains at least 70 wt.% of S'OS'.
8. Fat composition according to Claim 7, wherein fat B is cocoa butter.
9. Fat composition according to Claims 1-2, wherein fat A and fat B are present in ratios of 95-65% A : 5-35% B.
10. Confectionery products containing at least the fat compositions according to Claims 1-9.
11. Use of SSU-type triglycerides in chocolate compositions wherein a fat A which is high in SSU, preferably containing at least 60 wt.% of SSU, is used in chocolate compositions in order to obtain non-temper chocolate that demoulds easily and at the same time displays good gloss, hardness and melt-

down properties.

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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 3562

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DATABASE WPIL Section Ch, Week 8939, Derwent Publications Ltd., London, GB; Class D, AN 89-282409 & JP-A-01 206 950 (NIPPON OILS & FATS KK) 21 August 1989 * abstract *	1,3,4,10	A23D9/00 A23G3/00 A23G1/00
A	EP-A-0 428 200 (UNILEVER NV) 22 May 1991 * claim 4; example 1 *	1,5	
D,A	EP-A-0 354 025 (FUJI OIL COMPANY LIMITED) * page 3, line 3-32; examples 4,5 * * page 4, line 25 - line 29 *	3,6-8, 10,11	
A	EP-A-0 186 244 (UNILEVER NV) * claims 1,9,13-16; example 1 *	7-10	
A	US-A-4 072 766 (F.E. LUDDY ET AL) * column 3, line 19 - line 37; claims 1,2; example 4 * * column 8; table 1 * * column 4, line 47 - line 57 * * column 5, line 14 - line 40 *	8-12	TECHNICAL FIELDS SEARCHED (Int. Cl.5) A23D A23G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 JANUARY 1993	Examiner KANBIER D.T.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ***** & : member of the same patent family, corresponding document	

